M/035/009

UTAH DEPARTMENT OF HEALTH — PROMOTE PROTECT PREVENT

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MAY 2 1988
DIVISION OF OIL, GAS & MINING

March 11, 1988

Mr. Gerald Schurtz
Kennecott Explorations Ltd.
1515 Mineral Square
Box 11248
Salt Lake City, Utah 84121

Dear Mr. Schurtz:
This letter is a partial response to your proposal to construct gold processing facilities in Barneys Canyon. We appreciate company personnel escorting Charlie Dietz and Mack Croft over the project area March 2, 1988.

We are still in need of more information pertaining to the deposits that underlie the leach pads and the pond systems. The report contains the logs of numerous drill holes, but the log locations are not plotted on a map sufficiently detailed to show the holes, the leach pads, and leach ponds. A map showing the location of these logs with relation to the major components of this project should be provided for our review.

Unfortunately all the test pits that had been dug for the project had been filled in, so the the underlying deposits were not visible. We would like to arrange a date when a backhoe would be available, and we can revisit the area. This date should be after we have a detailed map showing the locations of the test holes and pits.

Several monitoring wells, some of which must be downgradient from the site, will be required as a condition of the approval. Some of the wells you have installed may partially fulfill this monitoring requirement. A detailed map should be prepared and made available before any further holes are drilled. We may request geophysical logs on 1 or 2 of the deeper monitoring wells.

We understand that leach pads are planned adjacent to the railroad cuts. It was observed that the cuts generally consist of coarse sand and gravel. This is an undesirable situation because any cyanide solutions would be rapidly transmitted through the gravel to the groundwater in the event of a leak or spill.

Groundwater is only about 200 feet in depth at the site and temperatures may not be high enough to volatilize the cyanide in solution. This is a different interpretation than what your company presents on page 72 of the proposal. In addition, most clay in Utah is montmorillinite which has little ability to attenuate CN^- ions. According to the cross sections presented in the report, the top of the water table in many areas is in the volcanic rocks. Volcanic rocks have very little ability to lower the pH of highly basic

solutions, so that CN^- would be free to chemically react with metals in the aquifer matrix. Under these conditions, the CN^- ion could travel a long distance in the ground water. Therefore, test holes and pits need to be dug beneath each leach pad and pond to determine the appropriateness of the site and the design needed for the foundations. Our examination of the site, showed us this has not been done.

The Bureau has made an extensive survey of the cyanide leach literature, and the criteria other states are using to regulate cyanide heap leach systems. For your information we are including our current thoughts on heap leach design in Utah, as follows:

1. A process solution collection system must be located immediately below the ore and immediately above the primary (flexible membrane) liner. It must be designed to convey the design leach flow with a maximum allowable head of twelve (12) inches. These design flow values including maximum application rate and maximum allowable head on the flexible membrane liner must be submitted for review and will become part of the operating conditions of the project. The system must consist of a high hydraulic conductivity media (Geotextile, drain net, gravel etc.) and a pipe collection system. If gravel is to be used it must be rounded and the maximum size shall be limited so the flexible membrane will not be damaged; or a sand cushion must be provided. Provisions must be made to prevent clogging of the process solution collection system with fines. The solution collection system piping must be of adequate strength to withstand the weight of trucks and ore loaded upon it.

   In addition, the solution collection system must have a continuous gravity exit so the fluids will not pond on the flexible membrane liner. A means must be provided to monitor the process solution head at designated locations in the heap, when start up operations begin. These measurements must be submitted to the Bureau of Water Pollution Control.

2. The flexible membrane must meet the minimum requirements of the National Sanitation Foundation (NSF) Standard No. 54. The flexible membrane must be protected above by the process solution collection system and below by the secondary liner. The liner must be installed at a minimum slope of 3 percent to provide a gradient for the process solution to flow towards the collection pipes. A liner/waste compatibility test must be conducted for all constituents in the process solution which will come in contact with the flexible membrane. If the manufacturers previous test information is adequate, it may be considered in lieu of running a new test. Procedures indicated in the most recent ASTM and EPA test methods will be acceptable if conducted over a reasonable period of time. If field seaming will be made with different or modified materials from the geomembrane, this must be considered in the testing procedure. At the conclusion of the test a summary report must be submitted for review indicating the constituents tested, the physical properties of the liner that were evaluated, and the conclusions drawn.

An operational condition of the permit will be that during the life of the project only those constituents tested for will be used in the process, unless additional compatibility testing is conducted. All flexible membranes, geotextiles, drainage nets, etc., must be handled, stored and installed according to the manufacturers recommendations. All field seams must utilize the shingle effect when appropriate and be made according to the most stringent requirements of the manufacturer and must be tested as specified in ASTM Standard Practice D4437-84. Flexible membrane liner specifications must include as a minimum the following:

a. type of liner material.
b. thickness of the liner.
c. proposed quality assurance procedures for installation.
d. proposed quality assurance procedures for field seaming.

The design, construction and quality assurance must be certified by a registered professional engineer to meet the State requirements for a heap leach system. Appropriate assurances and guarantees to support this certification must be sent to the Bureau of Water Pollution Control. The quality assurance procedures proposed to insure that the flexible membrane liner will be constructed to fulfill the intent of its design must be submitted for review.

Weather conditions specified by the manufacturer within which construction of the flexible membrane liner will be allowed, such as wind speed, precipitation, temperature range and soil moisture content, must be included in the specifications. Based on this information the months when these conditions would generally prevail and construction would be allowed should be identified.

3. The secondary liner must consist of clay material with a maximum permeability rate of 1.0×10^{-7} cm per second laid in 6 inch lifts. The thickness of the clay liner will be determined based upon further geologic investigations.

If bentonite addition or other additives is required the amount needed to achieve the 1.0×10^{-7} cm/sec permeability must be based on the most coarse soil from the site to obtain the upper bound clay requirement. The following information for constructing the clay secondary liner with the addition of Bentonite must be submitted for review:

a. the amount of bentonite required.
b. proposed mixing procedure (agricultural disk, rototiller or pug mill)
c. moisture content and the density at which the lowest permeability occurs.

The design and construction quality assurance program for each lift of the secondary liner and the secondary liner foundation must be submitted for review. The foundation must be stable for the design height of the heap leach pile with limited differential settlement so the integrity of

the liner system will not be compromised. The potential for geochemical reaction between leaching solutions and the clay material which might alter the properties of the clay must be evaluated.

4. The leakage detection/collection system located beneath the secondary liner must consist of a material with a permeability rate of 1.0×10^{-2} centimeters per second or greater laid on an acceptable base material with a permeability rate of 1.0×10^{-7} centimeters per second or less. The leakage detection/collection system must contain perforated piping which drain to the leakage collection sump. The leakage detection/collection system must cover the entire area beneath the heap leach pad. The head on the leakage required to cause the leakage to flow along the interface must be minimal. Piping must be compatible with the leakage fluids and must be of adequate strength to withstand the weight of the ore, etc., to be loaded upon it. The system must be designed so it will not be contaminated by clay material when the secondary liner is constructed above it.

   Once the site is excavated and prior to constructing the foundation for the liner system, an inspection must be conducted for springs, seeps etc., which may adversely impact the liner system. If any springs, seeps, etc., are discovered a proposal for diverting this water must be submitted to the Bureau of Water Pollution Control for review and approval prior to resuming construction.

The equipment, procedures and techniques which will be used to place the ore on the liner system must be submitted for review.

If you wish further information please contact Mack Croft or Charlie Dietz at 538-6146.

Sincerely,

Don A. Ostler

Don A. Ostler, Director
Utah Bureau of Water Pollution Control

cc: Mel Muir, SL City County Health Department
Brian Buck, JBR Consultants
Gayle Smith, Bureau DW/S
Greg Boyce, Utah Copper

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